

Listing of the Claims

This listing of Claims will replace all prior versions, and listings, of claims in the application.

1. (currently amended) A CPP giant magnetoresistive head comprising:
lower and upper shield layers with a predetermined shield distance therebetween; and
a giant magnetoresistive (GMR) element disposed between the upper and lower shield layers, the GMR element having a group of adjacent parallel layers, the group and comprising a pinned magnetic layer, a free magnetic layer and a nonmagnetic layer disposed between the pinned magnetic layer and the free magnetic layer, said group being free of an antiferromagnetic layer parallel to any layers of the group, wherein a current flows in a direction flowing perpendicularly to a film plane of the giant magnetoresistive element, and
wherein the pinned magnetic layer extends to a rear of the nonmagnetic layer and the free magnetic layer, in a height direction, and a dimension of the pinned magnetic layer in a height direction is larger than that in a track width direction.
2. (currently amended) The CPP giant magnetoresistive head according to claim 1, wherein the pinned magnetic layer comprises a magnetic material having a positive magnetostriction constant or a magnetic material having high coercive force, and an end of the pinned magnetic layer is exposed at a surface facing a recording medium.
3. (currently amended) The CPP giant magnetoresistive head according to claim 1, wherein the pinned magnetic layer has a laminated ferrimagnetic structure comprising a first pinned magnetic layer and a second pinned magnetic layer which are laminated with a nonmagnetic intermediate layer disposed therebetween, and the first and second pinned magnetic layers layer partially or entirely comprises Fe-Co-Cu (wherein Fe > 10 atomic percent, Co > 30 atomic percent, and Cu > 5 atomic

percent), Fe-Co-Cu-X (wherein X is at least one element of Pt, Pd, Mn, Si, Au, and Ag), or Co₂MnY Co₂MnY (wherein Y is at least one element of Ge, Si, Sn, and Al).

4. (withdrawn) The CPP giant magnetoresistive head according to claim 1, further comprising an antiferromagnetic layer provided in a rear of the giant magnetoresistive element in the height direction, for pinning the magnetization direction of the pinned magnetic layer in the height direction.

5. (withdrawn) The CPP giant magnetoresistive head according to claim 4, wherein the antiferromagnetic layer is an insulating antiferromagnetic layer comprising Ni-O or α -Fe₂O₃.

6. (withdrawn) The CPP giant magnetoresistive head according to claim 4, wherein the antiferromagnetic layer comprises an insulating antiferromagnetic comprising Ni-O or α -Fe₂O₃ and an antiferromagnetic metal layer interposed between the insulating antiferromagnetic layer and the pinned magnetic layer.

7. (original) The CPP giant magnetoresistive head according to claim 1, further comprising large-area nonmagnetic metal films provided between the giant magnetoresistive element and the lower shield layer and between the giant magnetoresistive element and the upper shield layer, respectively, so that the large-area nonmagnetic metal films are in direct contact with the pinned magnetic layer and the free magnetic layer and have larger areas than those of the pinned magnetic layer and the free magnetic layer, respectively.

8. (original) The CPP giant magnetoresistive head according to claim 7, wherein the large-area nonmagnetic metal film disposed between the giant magnetoresistive element and the lower shield layer comprises any one of Ta/Cu, Ta/Ru/Cu, Ta/Cr, Ta/Ni-Cr, Ta/(Ni-Fe)-Cr, and Cr, and when the composition contains Cr, the Cr content exceeds 20 atomic percent.

9. (currently amended) A CPP giant magnetoresistive head comprising;
lower and upper shield layers with a predetermined shield distance
therebetween; and

a giant magnetoresistive (GMR) element disposed between the upper and
lower shield layers, the GMR element having a group of adjacent parallel layers, the
group and-comprising a pinned magnetic layer, a free magnetic layer and a
nonmagnetic layer disposed between the pinned magnetic layer and the free magnetic
layer, said group being free of an antiferromagnetic layer parallel to any layers of the
group, wherein a current flows in a direction flowing-perpendicularly to a film plane of
the giant magnetoresistive element; and

wherein the pinned magnetic layer comprises a magnetic material having
a positive magnetostriction constant or a magnetic material having high coercive force,
and an end of the pinned magnetic layer is exposed at a surface facing a recording
medium.

10. (previously presented) The CPP giant magnetoresistive head according
to claim 9, wherein a dimension of the pinned magnetic layer in a height direction is
larger than the dimension in a track width direction.

11. (currently amended) The CPP giant magnetoresistive head according to
claim 9, wherein the pinned magnetic layer has a laminated ferrimagnetic structure
comprising a first pinned magnetic layer and a second pinned magnetic layer which
are laminated with a nonmagnetic intermediate layer disposed therebetween, and
the first and second pinned magnetic layers layer-partially or entirely comprises Fe-
Co-Cu (wherein Fe > 10 atomic percent, Co > 30 atomic percent, and Cu > 5 atomic
percent), Fe-Co-Cu-X (wherein X is at least one element of Pt, Pd, Mn, Si, Au, and
Ag), or Co₂MnY Co₂MnY (wherein Y is at least one element of Ge, Si, Sn, and Al).

12. (withdrawn) The CPP giant magnetoresistive head according to claim 9,
further comprising an antiferromagnetic layer provided in a rear of the giant
magnetoresistive element in the height direction, for pinning the magnetization
direction of the pinned magnetic layer in the height direction.

13. (withdrawn) The CPP giant magnetoresistive head according to claim 12, wherein the antiferromagnetic layer is an insulating antiferromagnetic layer comprising Ni-O or α -Fe₂O₃.

14. (withdrawn) The CPP giant magnetoresistive head according to claim 12, wherein the antiferromagnetic layer comprises an insulating antiferromagnetic comprising Ni-O or α -Fe₂O₃ and an antiferromagnetic metal layer interposed between the insulating antiferromagnetic layer and the pinned magnetic layer.

15. (original) The CPP giant magnetoresistive head according to claim 9, further comprising large-area nonmagnetic metal films provided between the giant magnetoresistive element and the lower shield layer and between the giant magnetoresistive element and the upper shield layer, respectively, so that the large-area nonmagnetic metal films are in direct contact with the pinned magnetic layer and the free magnetic layer and have larger areas than those of the pinned magnetic layer and the free magnetic layer, respectively.

16. (original) The CPP giant magnetoresistive head according to claim 15, wherein the large-area nonmagnetic metal film disposed between the giant magnetoresistive element and the lower shield layer comprises any one of Ta/Cu, Ta/Ru/Cu, Ta/Cr, Ta/Ni-Cr, Ta/(Ni-Fe)-Cr, and Cr, and when the composition contains Cr, the Cr content exceeds 20 atomic percent.